OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **TOM POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *variable* in-lake chlorophyll-a trend. Chlorophyll concentrations returned to the high levels recorded in 1998, and the average concentration was above the New Hampshire mean. An algae bloom apparently occurred in June and also in August. Residents noticed a fishy odor coming from the lake, which can often indicate an algae bloom. The golden-brown alga *Chrysosphaerella* was the one of the dominant algae in the August plankton sample. *Chrysosphaerella* is known to give off a fishy odor when abundant, as does the diatom *Rhizosolenia,* which was the dominant alga in the plankton sample. Also, rains and spring snowmelt seem to be negatively affecting the balance of the pond by causing the Warner River to flood, thereby bringing an excess amount of nutrients into the lake. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable* trend in lake transparency, although this year's average reading was slightly reduced from the 1999 data. Transparency was low in June and August due to the algae blooms that were occurring. July clarity improved to normal readings for the pond as the chlorophyll-a concentration was low during that month. The 2000 sampling season was considered to be wet and, therefore,

average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *fairly stable* trend for the epilimnetic phosphorus levels, while the hypolimnetic concentrations are *variable*. Phosphorus concentrations were slightly elevated in both layers in June and August. Phosphorus concentrations did remain below the New Hampshire median, which we hope will continue. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- The Warner River has typically flooded in the spring for many years. The floods bring large amounts of nutrients into the pond and can consequently cause an early spring algae bloom. The early bloom usually consists of diatoms and golden-brown algae. There is also a layer of blue-green algae that sits near the bottom of the pond and will float to the surface every once in a while. Due to these conditions, we would like to visit the pond in early June this coming summer. We have not collected a plankton sample in June since Tom Pond joined VLAP. Contact the VLAP Coordinator at (603) 271-2658 this spring to schedule our visit.

- The average conductivity levels in the Tom Pond watershed have varied since 1993 (Table 6). This year's results were slightly less than last year's, which were a result of pollutants and nutrients concentrating in the waters without the proper rainfall to keep the waters continuously flowing. Conductivity levels have increased slightly since the pond was first monitored as part of VLAP. It is important for the health of the pond to determine the sources of these increases. Contact the VLAP Coordinator for ideas regarding a more in-depth sampling program at Tom Pond.

- Total phosphorus concentrations observed in the Inlet this year were the lowest since 1996 (Table 8), as were the turbidity values (Table 11). While concentrations are still considered high, the decrease is a

positive sign for the water quality of Tom Pond. We will continue to observe the trends of the Inlet. If phosphorus levels return to the excessive amounts noted in the past we will suggest a more stringent sampling regime for the Inlet.

- Dissolved oxygen was high throughout the water column in August (Table 9). Shallow Ponds tend to mix continuously by wind and wave action, thereby allowing for oxygen exchange with the atmosphere.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were low at the sites tested (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

- The turbidity of the Inlet has been high since 1997 (Table 11). While the mean reading has decreased since that time, it would be worthwhile to determine the cause of this high turbidity through additional sampling on sections of the Inlet. Next summer please make note of the conditions of this Inlet on the field data sheets, whether sediment is accumulating in any area or if the water is naturally turbid. We should be informed of erosion problems that are noted on any part of the stream bank.

NOTES

- Monitor's Note (8/25/00): Inlet dry. Odor coming from pond, possible algae bloom.

- Biologist's Note (8/25/00): Chlorophyll-a high, indicative of algae bloom.

USEFUL RESOURCES

Road Salt and Water Quality, WD-WSQB-7, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

What is a Watershed?, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

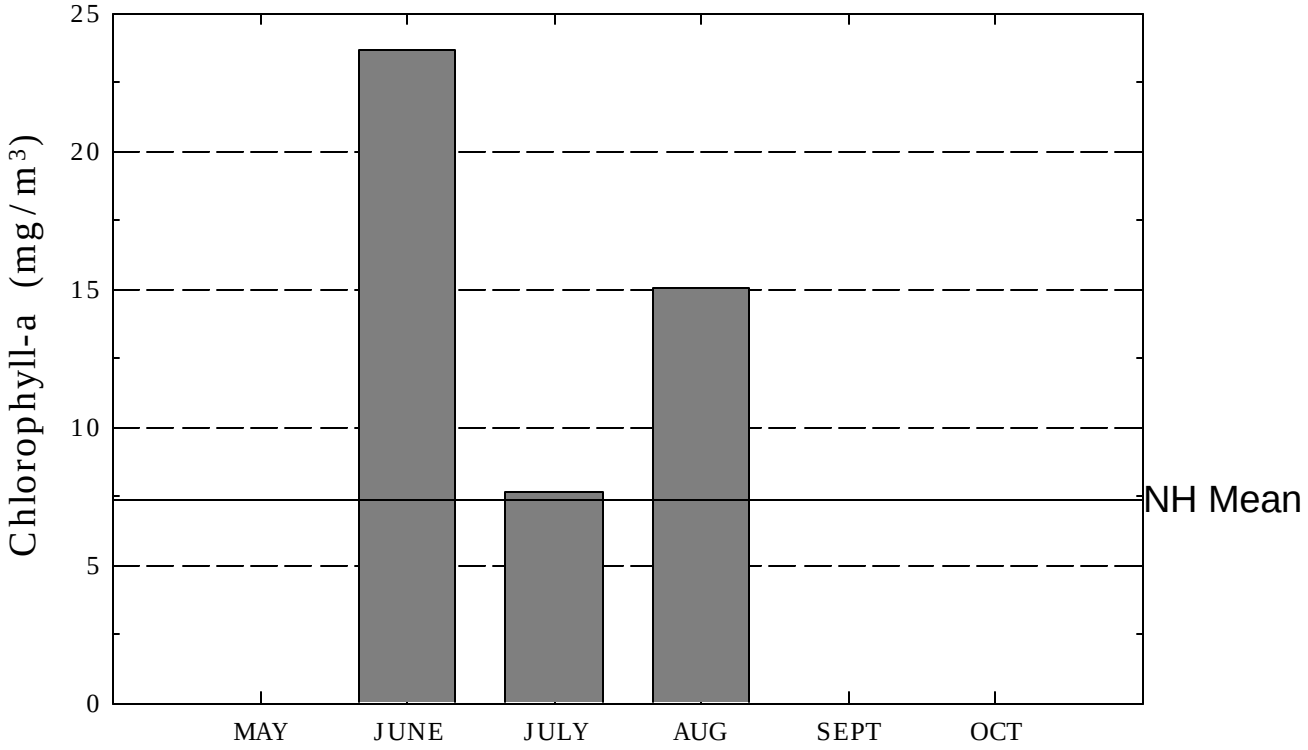
Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

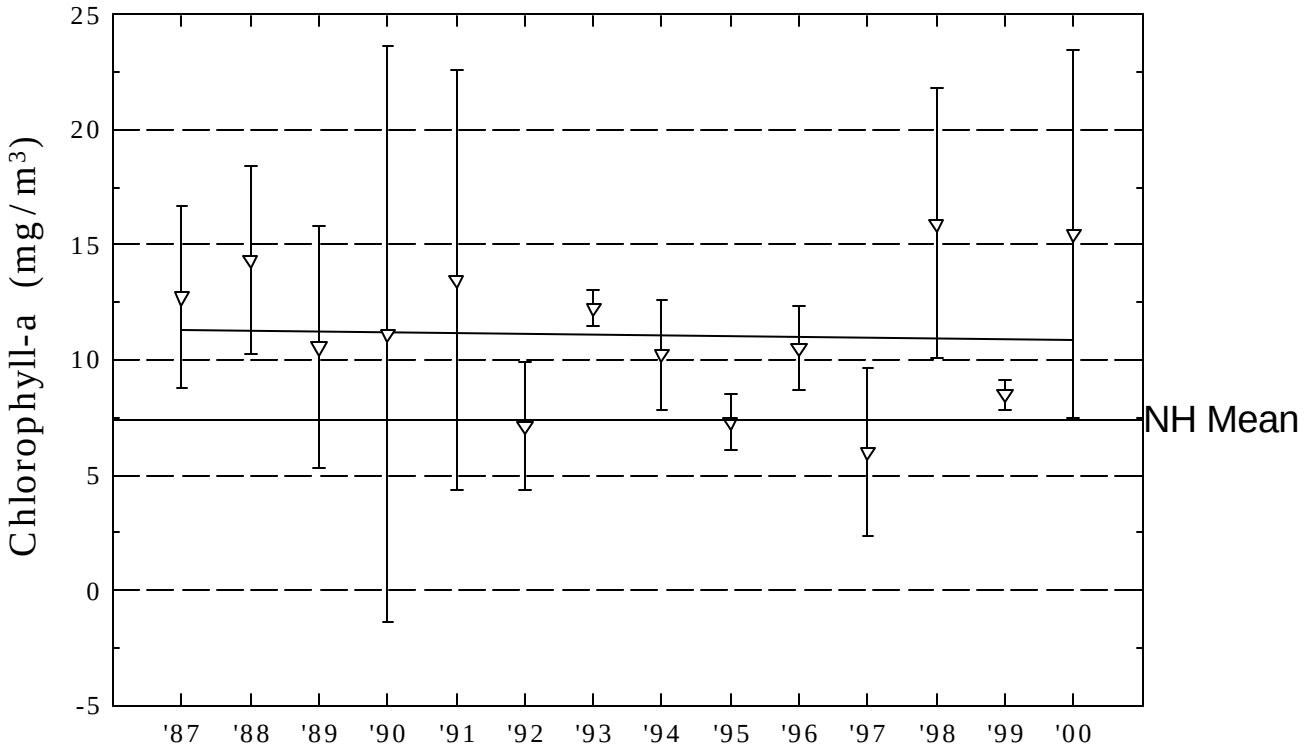
Save Our Streams Handbook for Wetlands Conservation and Sustainability. (800) BUG-IWLA, or visit www.iwla.org

Tom Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



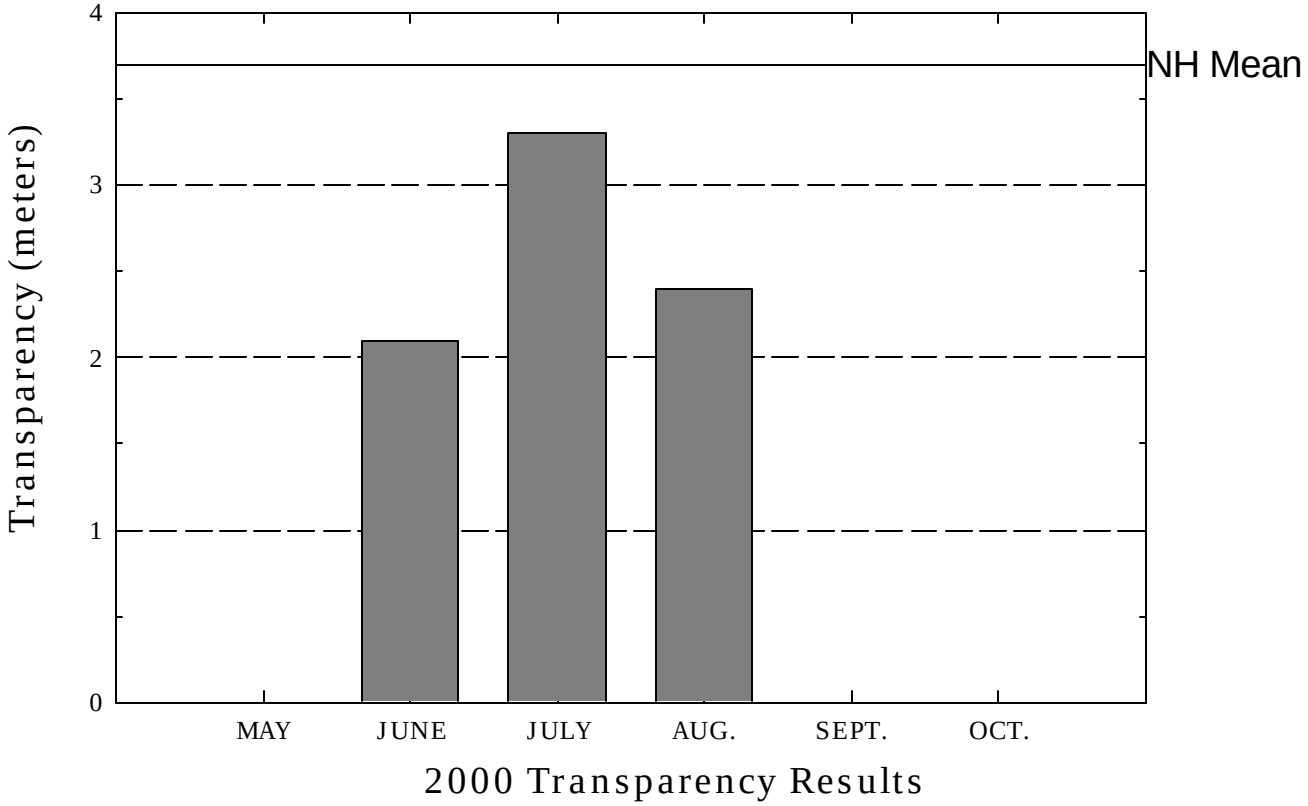
2000 Chlorophyll-a Results

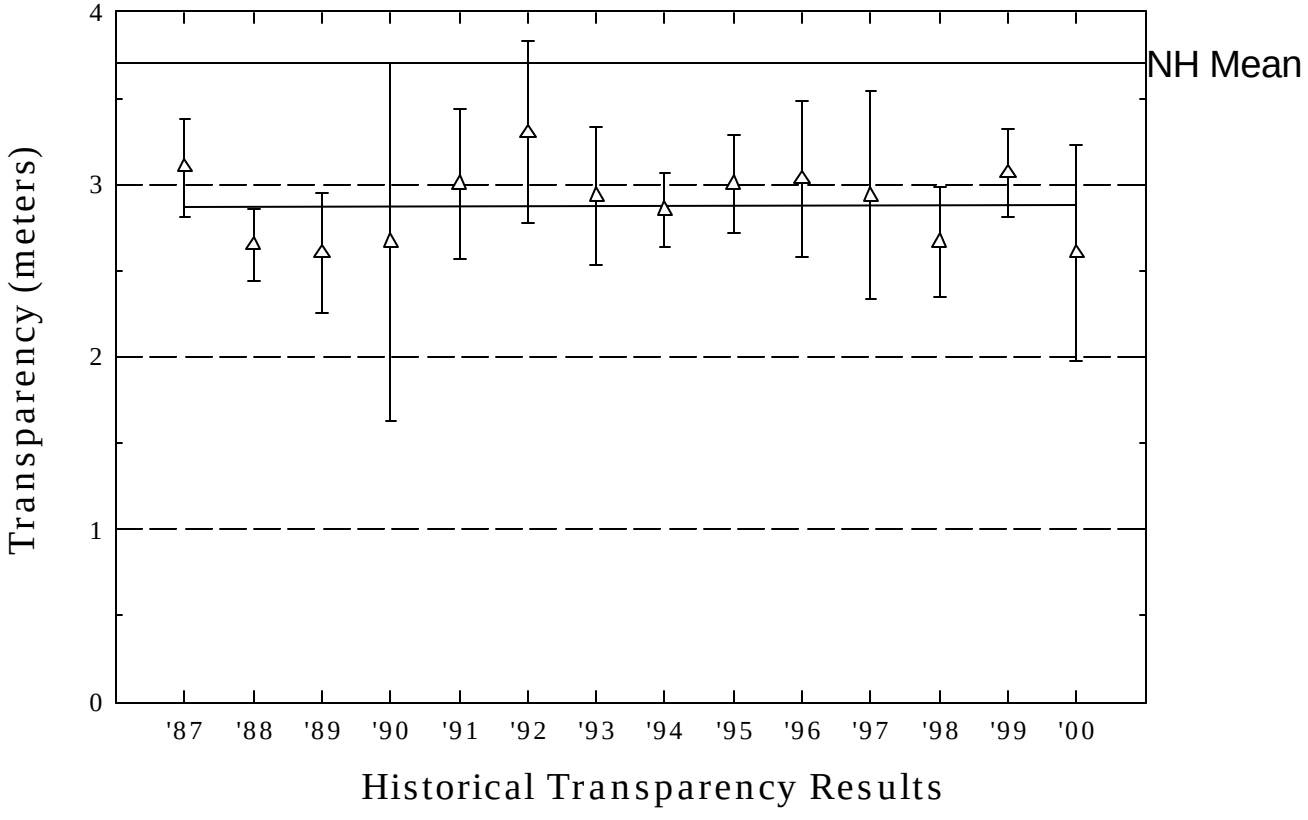


Historical Chlorophyll-a Results

Tom Pond

Figure 2. Monthly and Historical Transparency Results





Tom Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

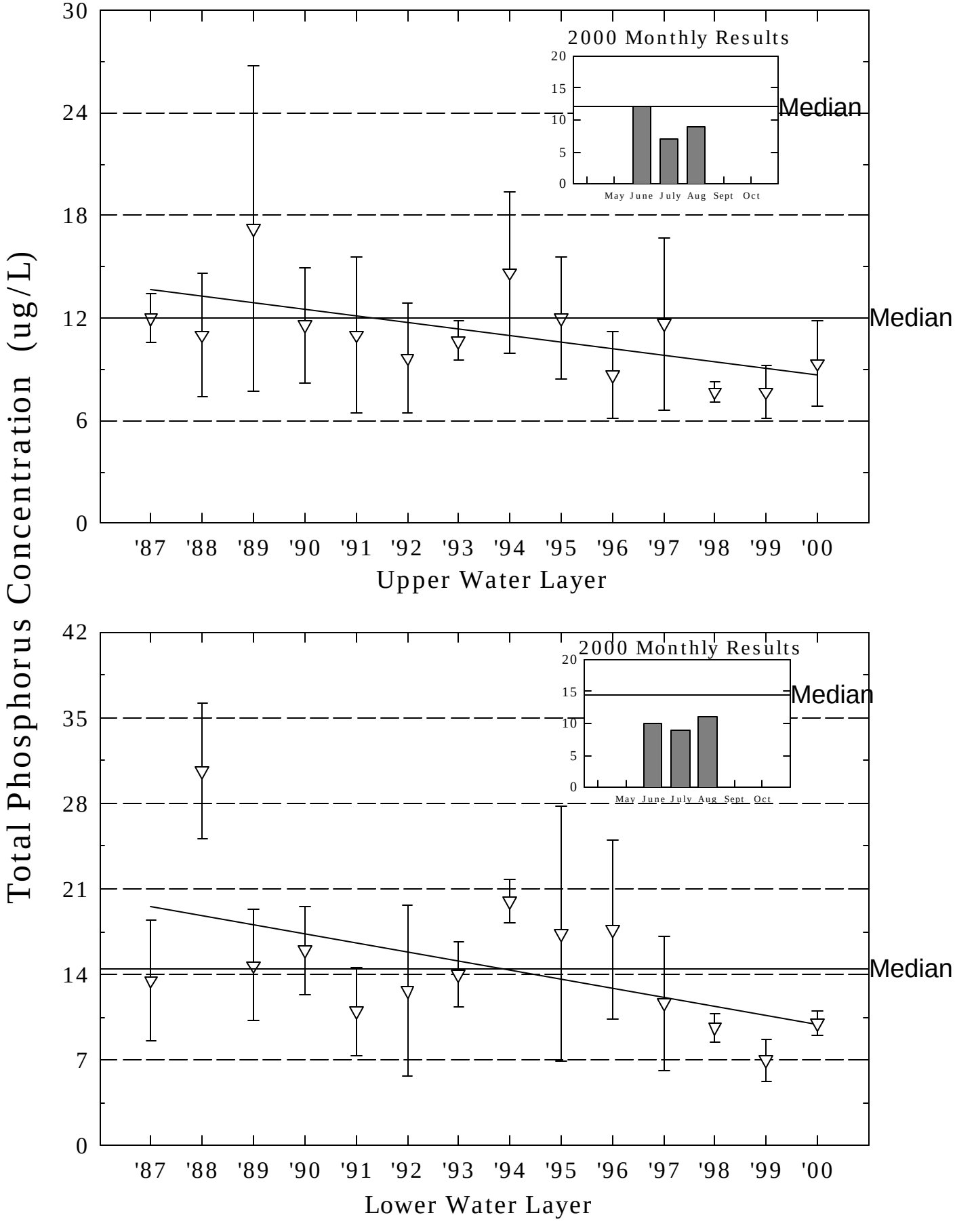


Table 1.

TOM POND

WARNER

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1987	9.97	15.54	12.75
1988	11.08	18.95	14.34
1989	2.89	14.38	10.93
1990	0.00	29.60	7.87
1991	8.03	24.00	13.49
1992	5.12	10.30	7.15
1993	11.68	12.82	12.25
1994	7.49	11.73	10.25
1995	6.02	8.41	7.30
1996	8.46	11.97	10.54
1997	3.65	10.24	6.02
1998	11.57	22.62	15.12
1999	8.04	8.98	8.51
2000	7.70	23.71	15.48

Table 2.

TOM POND

WARNER

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07 / 24 / 1987	TINY FLAGELLATES	67
07 / 06 / 1988	CHRYSOSPHAERELLA	66
09 / 12 / 1989	CHRYSOSPHAERELLA	93
09 / 12 / 1989	CHRYSOSPHAERELLA	93
07 / 02 / 1990	DINOBRYON	83
	CHRYSOSPHAERELLA	10
07 / 10 / 1991	MELOSIRA	61
	CHRYSOSPHAERELLA	16
	RHIZOSOLENIA	15
08 / 30 / 1992	MICROCYSTIS	31
	DINOBRYON	24
	MELOSIRA	22
09 / 12 / 1993	MELOSIRA	86
	CHRYSOSPHAERELLA	9
07 / 14 / 1994	MELOSIRA	40
	SYNEDRA	33
	RHIZOSOLENIA	23
07 / 05 / 1995	DINOBRYON	84
	MELOSIRA	35
	MERISMOPEDIA	1
07 / 08 / 1996	SYNEDRA	29
	RHIZOSOLENIA	24
	MELOSIRA	19

Table 2.

TOM POND

WARNER

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
07 / 27 / 1997	MELOSIRA	36
	SYNEDRA	23
	DINOBRYON	16
07 / 23 / 1998	RHIZOSOLENIA	45
	SYNEDRA	45
	MELOSIRA	6
08 / 14 / 1998	MELOSIRA	83
	RHIZOSOLENIA	13
	TABELLARIA	3
07 / 06 / 1999	CHRYSOSPHAERELLA	66
	MELOSIRA	19
	DINOBRYON	15
08 / 25 / 2000	RHIZOSOLENIA	36
	MOUGEOTIA	26
	CHRYSOSPHAERELLA	20

Table 3.

TOM POND

WARNER

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1987	2.9	3.3	3.1
1988	2.5	2.8	2.6
1989	1.7	3.1	2.3
1990	1.5	3.5	2.8
1991	2.5	3.3	3.0
1992	2.7	3.7	3.3
1993	2.5	3.3	2.9
1994	2.7	3.0	2.8
1995	2.8	3.2	3.0
1996	2.6	3.5	3.0
1997	2.3	3.5	2.9
1998	2.3	2.9	2.6
1999	2.8	3.3	3.0
2000	2.1	3.3	2.6

Table 4.

TOM POND

WARNER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
ANNIS LOOP INLET				
	1990	6.58	6.58	6.58
COSSETTE WELL				
	1989	6.22	6.22	6.22
EPILIMNION				
	1987	6.66	6.85	6.74
	1988	7.07	7.18	7.13
	1989	6.34	7.37	6.68
	1990	6.51	7.36	6.68
	1991	7.10	7.32	7.19
	1992	6.90	7.22	7.09
	1993	7.09	7.25	7.17
	1994	6.98	7.18	7.05
	1995	7.15	7.35	7.21
	1996	6.46	6.92	6.67
	1997	6.90	7.22	7.02
	1998	6.45	6.97	6.75
	1999	6.84	7.23	7.05
	2000	6.73	7.13	6.84
HAMILTON WELL				
	1989	6.17	6.60	6.33
	1995	6.30	6.30	6.30

Table 4.

TOM POND

WARNER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1987	6.24	6.88	6.45
	1988	6.58	6.71	6.65
	1989	6.14	7.19	6.48
	1990	6.35	6.99	6.48
	1991	6.91	7.25	7.03
	1992	6.53	7.11	6.78
	1993	6.87	7.40	7.07
	1994	6.34	6.84	6.57
	1995	6.75	7.11	6.92
	1996	6.23	6.46	6.33
	1997	6.71	7.08	6.91
	1998	6.34	6.60	6.45
	1999	6.75	7.02	6.86
	2000	6.17	6.37	6.27
INLET				
	1989	6.11	6.31	6.21
	1990	6.13	6.98	6.47
	1991	6.49	6.63	6.55
	1992	6.54	6.54	6.54
	1994	6.34	6.36	6.35
	1995	7.18	7.18	7.18
	1996	6.22	6.41	6.28
	1997	6.41	6.68	6.52
	1998	6.14	6.19	6.16
	2000	6.19	6.26	6.22

Table 4.

TOM POND

WARNER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
OUTLET				
	1987	6.93	6.99	6.96
	1988	6.49	7.17	6.76
	1989	6.46	7.03	6.69
	1990	6.17	7.17	6.40
	1991	6.73	7.04	6.87
	1992	6.93	7.20	7.03
	1993	7.03	7.37	7.12
	1994	6.73	7.08	6.91
	1995	7.07	7.23	7.15
	1996	6.40	6.86	6.55
	1997	6.87	7.05	6.98
	1998	6.51	6.89	6.72
	1999	6.75	6.98	6.85
	2000	6.74	6.85	6.79

Table 5.

TOM POND

WARNER

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1988	6.70	12.20	9.33
1989	5.60	11.30	8.48
1990	6.10	11.00	8.65
1991	9.60	10.90	10.30
1992	8.80	13.60	11.07
1993	10.00	12.60	11.17
1994	9.20	12.90	10.50
1995	9.70	13.10	11.37
1996	8.40	11.40	10.23
1997	9.80	11.60	10.77
1998	9.40	15.30	11.10
1999	9.80	13.70	11.40
2000	9.70	10.60	10.20

Table 6.

TOM POND
WARNER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
ANNIS LOOP INLET				
	1990	36.9	36.9	36.9
COSSETTE WELL				
	1989	303.0	303.0	303.0
EPILIMNION				
	1987	72.1	84.6	78.3
	1988	74.5	88.7	80.7
	1989	56.0	90.3	74.3
	1990	18.4	96.5	53.6
	1991	85.4	93.1	89.9
	1992	79.6	99.8	89.8
	1993	103.8	116.2	111.1
	1994	85.5	105.2	95.6
	1995	96.8	110.4	105.4
	1996	91.3	101.4	96.7
	1997	102.1	122.0	112.8
	1998	85.6	118.6	100.1
	1999	114.3	126.7	121.4
	2000	99.7	107.2	104.0
HAMILTON WELL				
	1989	58.2	93.4	72.0
	1995	78.0	78.0	78.0
HYPOLIMNION				
	1987	73.2	84.2	78.7
	1988	66.9	87.7	77.7

Table 6.

TOM POND
WARNER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1989	62.3	90.1	76.5
	1990	26.9	82.4	60.5
	1991	82.6	93.2	88.8
	1992	73.4	99.4	87.2
	1993	102.3	114.7	109.8
	1994	67.6	107.6	87.7
	1995	86.3	111.0	102.0
	1996	68.9	98.7	86.8
	1997	98.3	121.5	111.2
	1998	78.7	99.1	90.8
	1999	115.1	127.4	121.4
	2000	83.9	109.4	98.5
INLET				
	1989	152.1	279.4	225.5
	1990	143.5	230.7	185.8
	1991	160.2	234.0	197.1
	1992	338.0	338.0	338.0
	1994	225.0	255.0	240.0
	1995	108.9	108.9	108.9
	1996	138.1	234.0	181.7
	1997	189.0	233.8	211.4
	1998	173.2	195.6	184.4
	2000	176.6	214.0	195.3
OUTLET				
	1987	73.7	84.5	79.1

Table 6.

TOM POND

WARNER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1988	72.4	88.7	79.8
	1989	62.1	93.4	76.3
	1990	55.6	95.9	69.4
	1991	74.2	94.5	87.4
	1992	78.4	97.5	88.3
	1993	102.7	115.8	110.0
	1994	88.1	107.0	96.6
	1995	95.4	108.3	103.6
	1996	92.0	100.6	97.5
	1997	101.1	119.0	111.4
	1998	85.6	118.9	103.1
	1999	113.4	127.7	120.7
	2000	99.4	106.1	103.8

Table 8.

TOM POND

WARNER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
ANNIS LOOP INLET				
	1990	16	16	16
COSSETTE WELL				
	1989	4	4	4
EPILIMNION				
	1987	11	13	12
	1988	7	14	11
	1989	10	30	16
	1990	7	16	11
	1991	7	16	11
	1992	6	12	9
	1993	10	12	10
	1994	11	20	14
	1995	9	16	12
	1996	6	11	8
	1997	7	17	11
	1998	7	9	8
	1999	6	9	7
	2000	7	12	9
HAMILTON WELL				
	1989	1	5	2
HYPOLIMNION				
	1987	10	17	13
	1988	27	37	30
	1989	9	20	14

Table 8.

TOM POND

WARNER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1990	11	20	16
	1991	8	15	11
	1992	6	20	12
	1993	12	17	14
	1994	19	22	20
	1995	9	29	17
	1996	12	26	17
	1997	8	18	11
	1998	9	13	10
	1999	5	8	7
	2000	9	11	10
INLET				
	1988	92	92	92
	1989	10	46	30
	1990	18	117	47
	1991	28	59	43
	1992	14	14	14
	1994	120	206	163
	1995	8	8	8
	1996	43	77	57
	1997	62	79	70
	1998	46	60	53
	2000	24	31	27
LITTLE BEAVER INLET				
	1989	20	20	20

Table 8.

TOM POND

WARNER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
OUTLET				
	1987	6	10	8
	1988	9	10	9
	1989	12	19	15
	1990	8	53	19
	1991	10	22	17
	1992	5	10	7
	1993	6	13	10
	1994	8	16	12
	1995	2	16	8
	1996	8	16	11
	1997	8	29	20
	1998	7	9	7
	1999	8	16	11
	2000	7	10	8
WARNER RIVER				
	1989	12	12	12

Table 9.

TOM POND

WARNER

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		August 25, 2000	
0.1	22.3	10.1	116.5
1.0	21.6	10.2	116.0
2.0	20.2	10.1	111.8
3.0	19.3	7.4	79.9
3.5	18.6	3.3	35.2

Table 10.

TOM POND

WARNER

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 24, 1987	4.0	14.8	0.3	3.0
July 6, 1988	4.0	17.0	3.6	37.0
September 12, 1989	3.5	19.0	4.5	48.0
September 12, 1989	3.5	19.0	4.5	48.0
July 2, 1990	3.5	15.5	5.7	57.2
August 30, 1992	4.0	20.8	9.1	102.3
September 12, 1993	4.0	19.0	8.3	89.0
July 14, 1994	4.0	17.0	6.6	67.0
July 5, 1995	4.0	22.4	9.9	111.0
July 8, 1996	3.5	18.0	12.6	132.0
July 27, 1997	3.0	21.4	10.4	115.0
July 23, 1998	4.0	14.1	0.2	2.0
July 6, 1999	3.5	23.6	7.0	82.0
August 25, 2000	3.5	18.6	3.3	35.2

Table 11.

TOM POND

WARNER

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.3	0.8	0.6
	1998	0.5	1.8	1.0
	1999	0.6	1.2	0.8
	2000	0.6	0.7	0.7
HYPOLIMNION				
	1997	0.6	0.8	0.7
	1998	1.1	1.2	1.2
	1999	0.5	1.0	0.8
	2000	1.0	1.2	1.1
INLET				
	1997	15.2	39.0	27.1
	1998	12.1	19.2	15.6
	2000	5.8	8.6	7.2
OUTLET				
	1997	0.6	2.9	1.4
	1998	0.6	1.7	1.1
	1999	0.6	1.1	0.7
	2000	0.8	1.3	1.0

Table 12.

TOM POND

WARNER

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
INLET		
	June 25	3
	July 23	1
OUTLET		
	June 25	10
	July 23	4

NOTE: "<" means "less than" and ">" means "greater than"